



14XM LAUNCH



GLOBALFOUNDRIES

Smart Mobile Computing Continues to Evolve: New Product Innovations Introduced Every Year



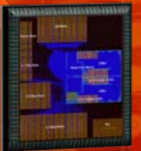
Higher data
rates



High resolution
screens



Multicore
processors

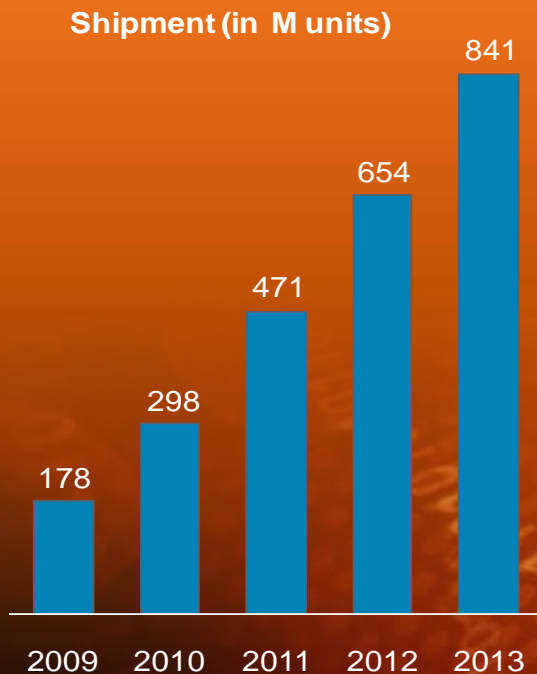


Thinner form
factors



Low Power Is Critical For Mobility Market

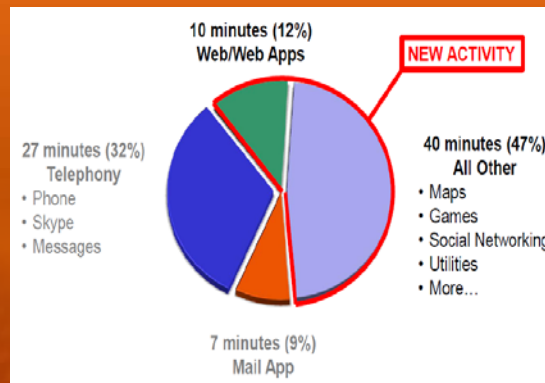
Explosive growth in smartphone sales



Source: Gartner

New consumer appetite , driving more compute

Average daily use of smartphone

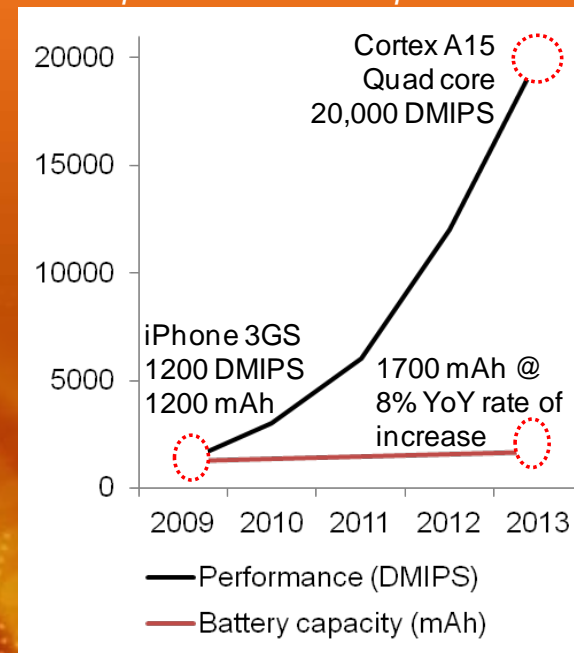


Source: KPCB

60% time spent on smartphones is new activity for mobile users

...However, battery technology fails to keep up with Moore's law

Performance versus battery life improvement in smartphones



Source: GLOBALFOUNDRIES



Battery Life Remains a Primary Challenge

Digital Trends

“Top three problems the mobile industry needs to solve:

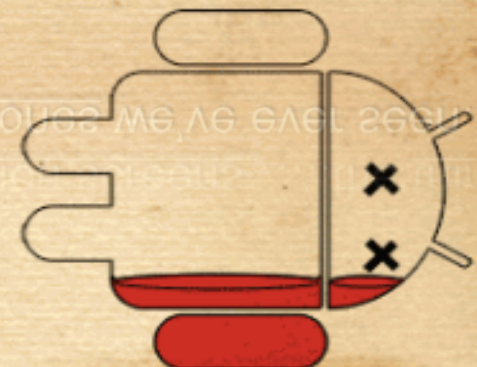
#1 – Battery life

#2 – O/S Fragmentation

#3 – Network coverage ”

Smartphone Geeks

“The biggest problem with smartphone battery life is the current state of innovation. manufacturer is pushing two things: power and size. faster processors and higher resolution screensthe thinnest phones we’ve ever seen.”



Source : <http://smartphonegeeks.in>



Power is Also The Primary Consideration For Enterprise/Networking Segment

Ubiquitous cloud computing drives more networking and enterprise hardware deployment

Multicore architecture, higher port densities, escalating data storage → more performance (and power) hungry requirements

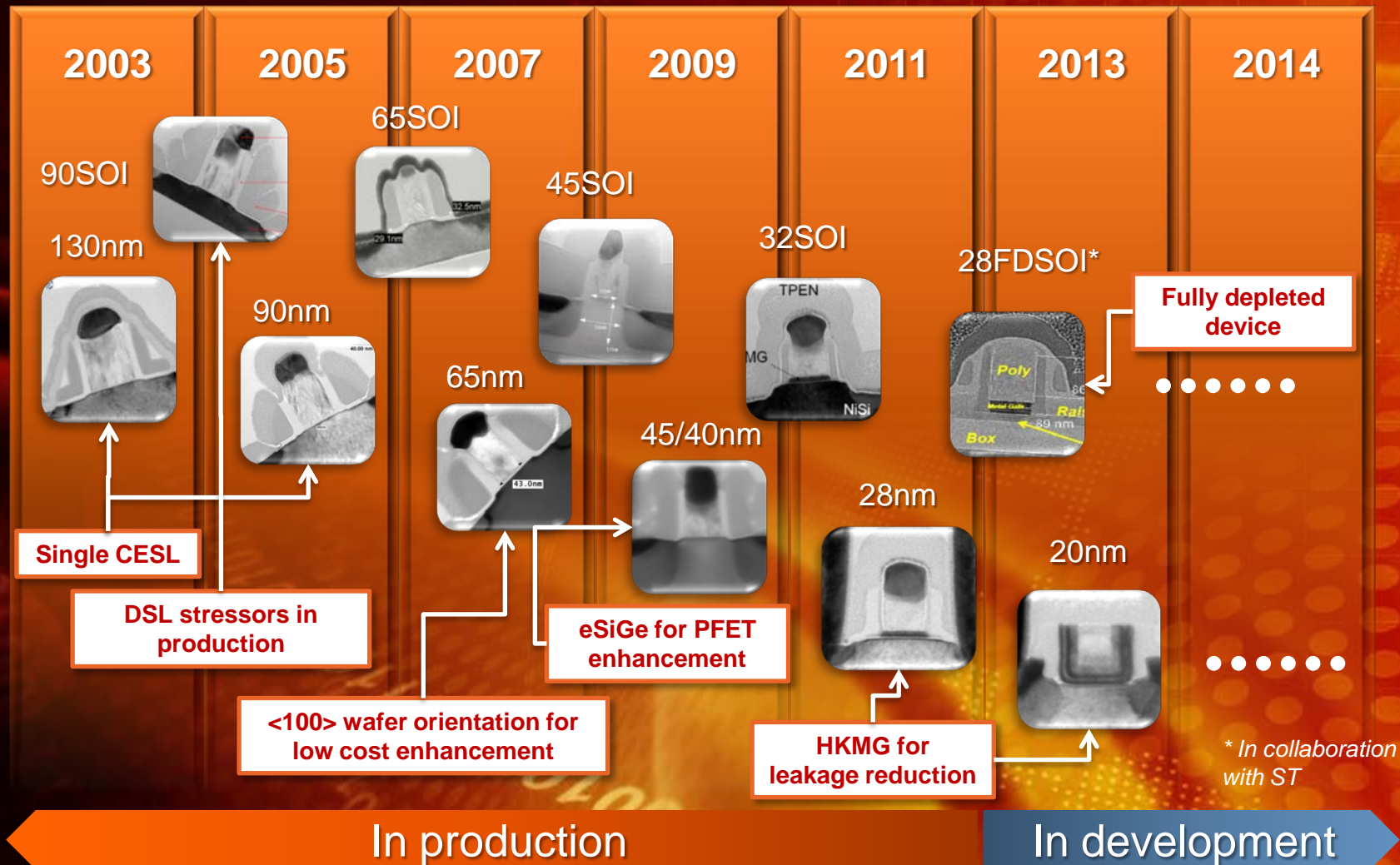


Need more energy efficient solutions

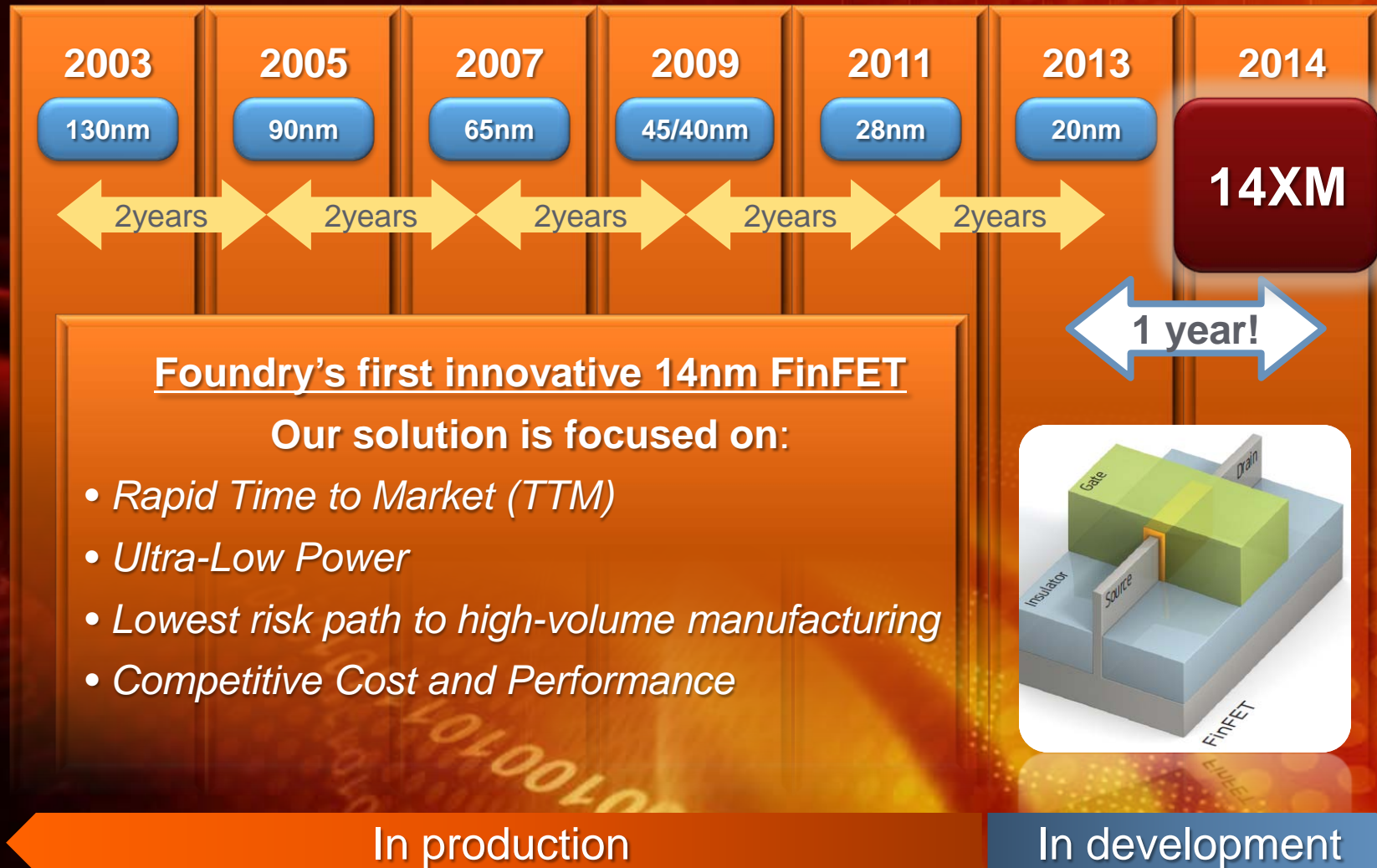
Drive for reduced carbon footprints, Less CO₂ emissions, Forest environment preservation



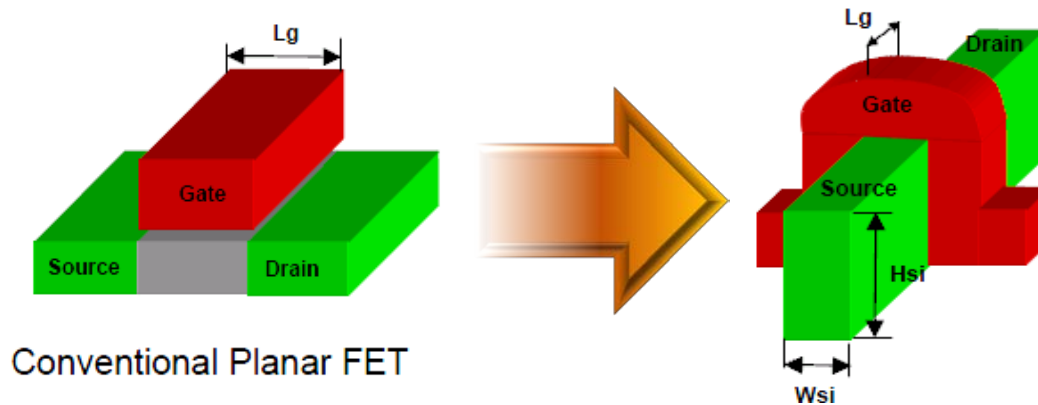
Deploying Technology Solutions to Meet the Most Stringent Market Needs



Introducing 14XM (eXtreme M**o**bility)



FinFET Overview



A device “turned on its edge and folded” to make a double-gate (or even tri-gate) device

Fin height plays role of device width

Double-gate affords better scaling

Device widths become quantized via number of fins

Superior low power attributes

Intrinsically operates at a lower Vdd

Lowest off state leakage

➔ **Longer battery life and lower power consumption**



14XM - Foundry's First Innovative 14nm FINFET

Built on deep heritage of FinFET R&D and solid foundation of HKMG production experience

Combines 14nm-class FinFET device with our 20nm-LPM process elements

Unique 'Fin-Friendly-Migration' (FFM) rules to allow fast porting of planar designs to FinFET

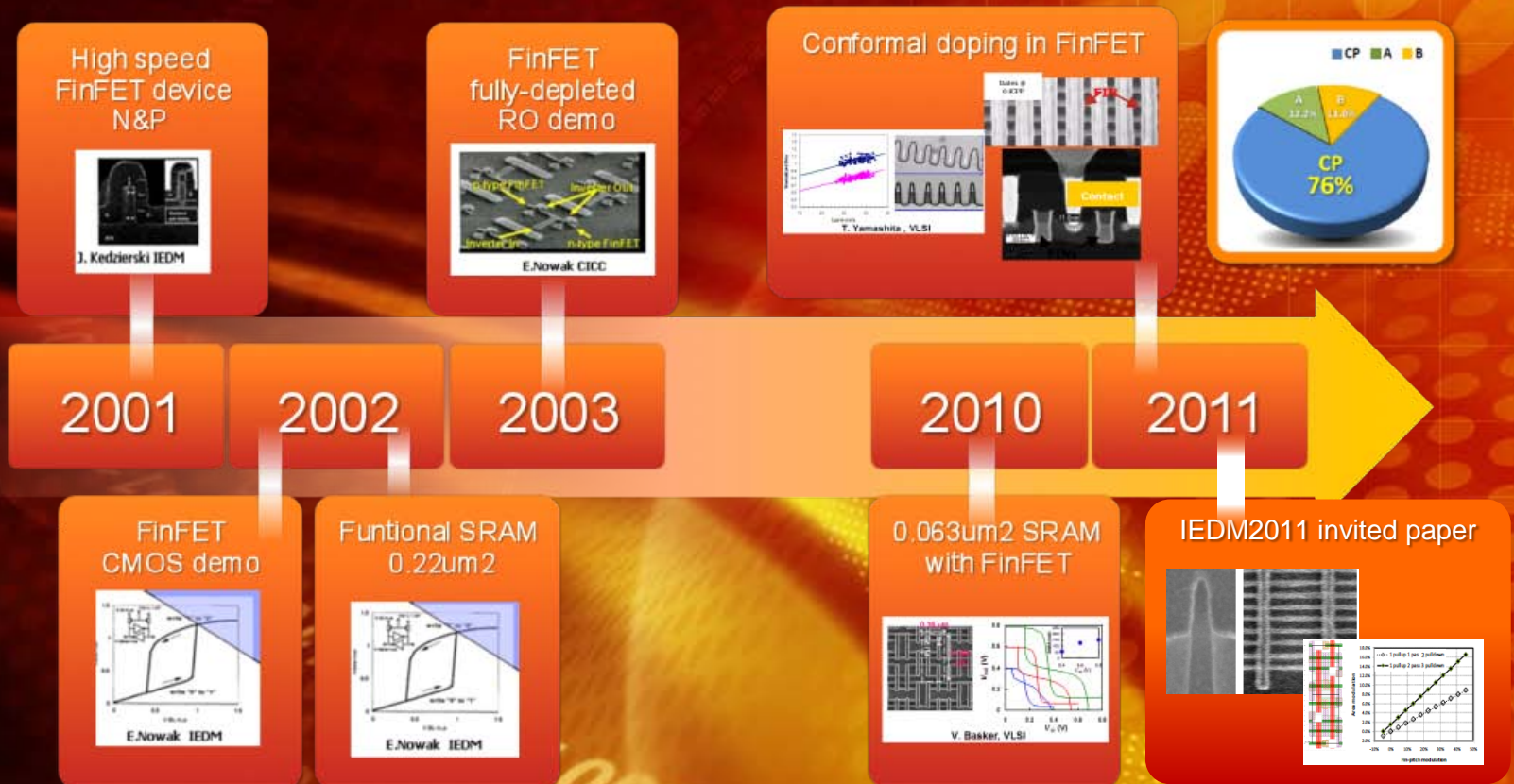
Technology architecture leadership for balanced performance and power consumption, and cost

Unprecedented collaboration model with fabless-EDA-IP partners, solution driven to realize next generation product innovations concurrently

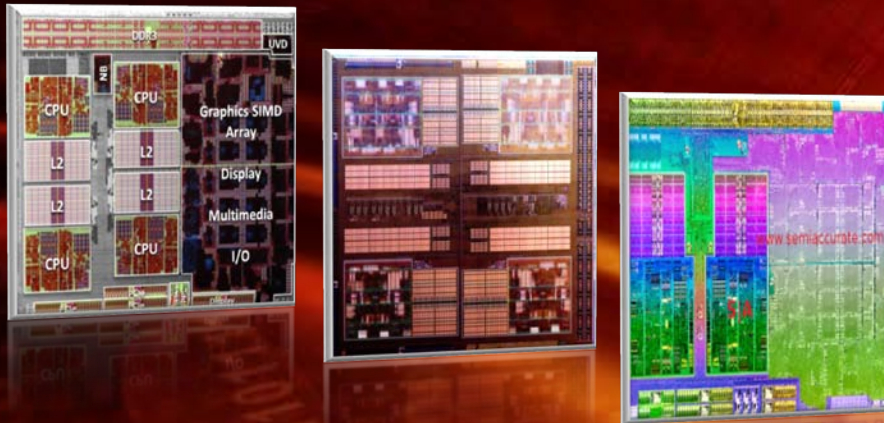


FinFET Is New To Foundries? Not Really....

We have a decade of deep FinFET R&D activities and accomplishments



Solid HKMG Production Experience



**Leading foundry in
both volume and
lowest D0**

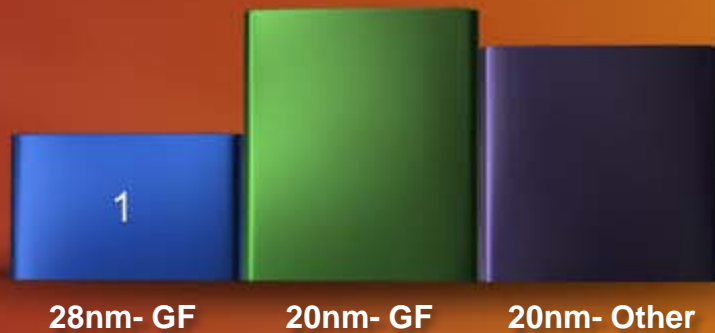
Shipped 400,000 wafers

*D0 (Bose-Einstein) $\ll 0.1$
(def/in²/layer)*

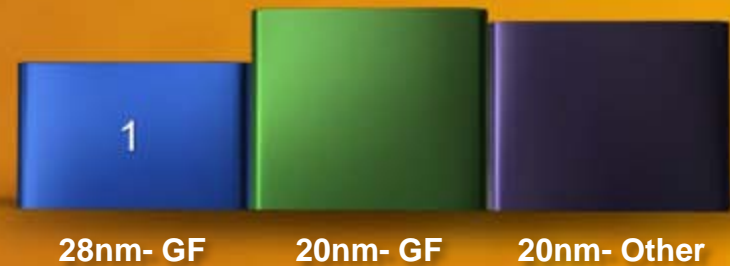
**Repeat leadership
ramp for 14nm
FinFET production**



PPC (Mhz/W/\$)

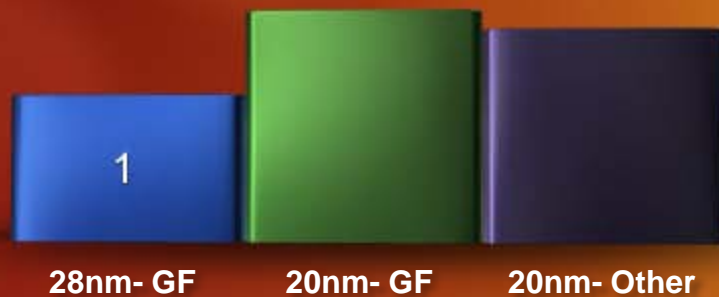


Active Battery Life

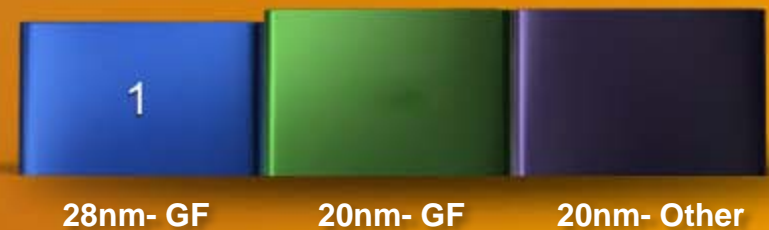


20nm-LPM: Wins Across All Key Metrics

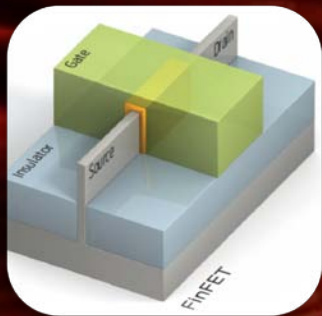
GDPW



Fmax@ Vnom



Leveraging Leading 20nm-LPM Planar Technology For Fastest TTV



14nm class
FinFET
transistors

Proven optimized Middle
of Line (MOL) from 20LPM

(eg W-MOL with tightest DR enable 8T std cells)

Cost and Density optimized
BEOL from 20LPM

(eg 80nm SP wiring, 2-3 levels of 64Mx routing)

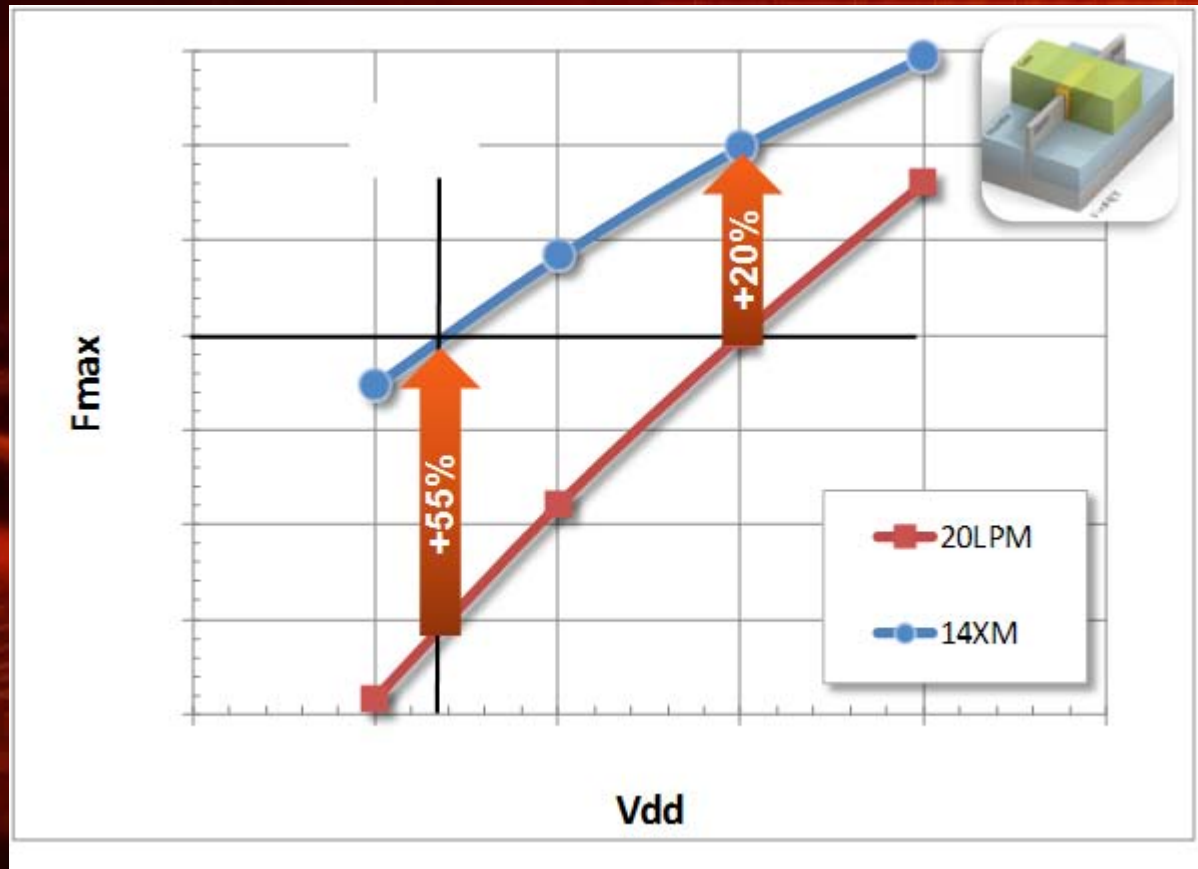
‘FFM’ layout rules for fastest
port of existing design IPs

*(eg Fin-Friendly rules to allow planar design
migration)*

14XM



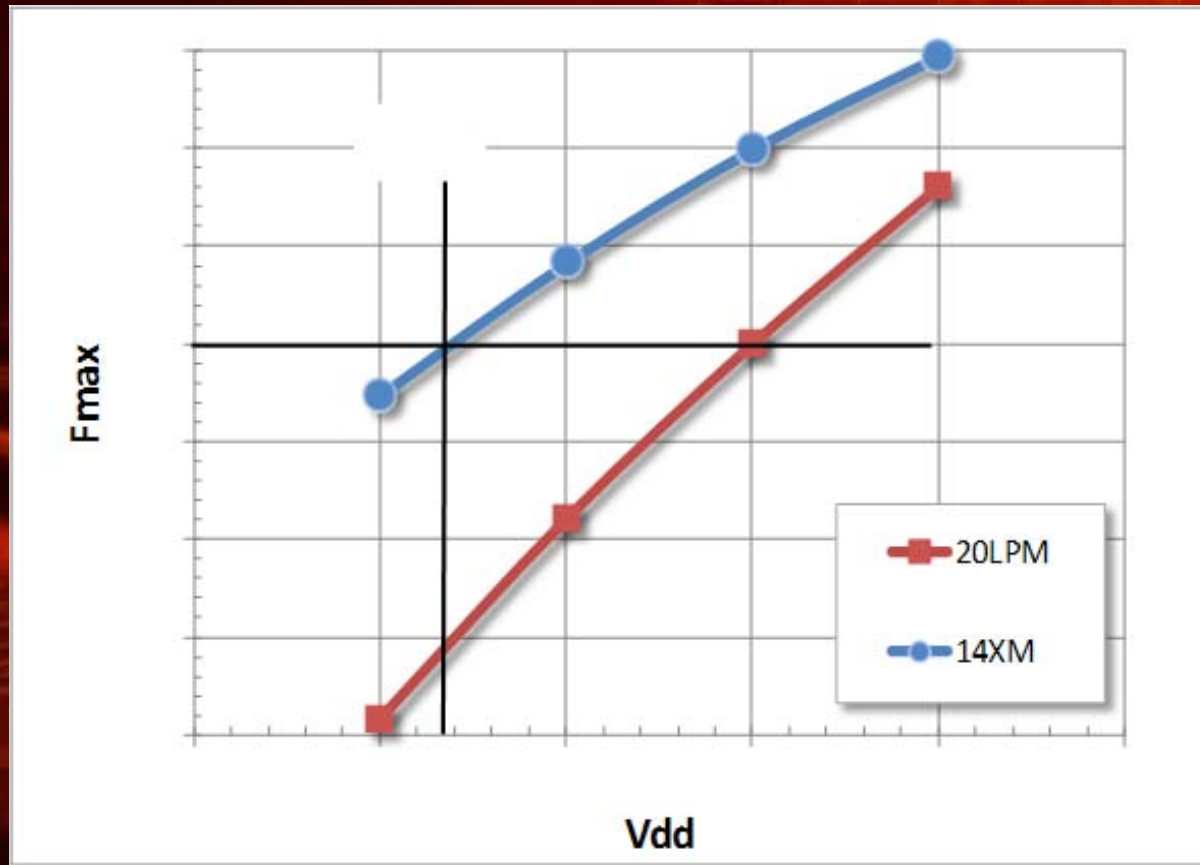
14XM - Power / Performance Benefits



20%-55% higher performance depending on operating voltage



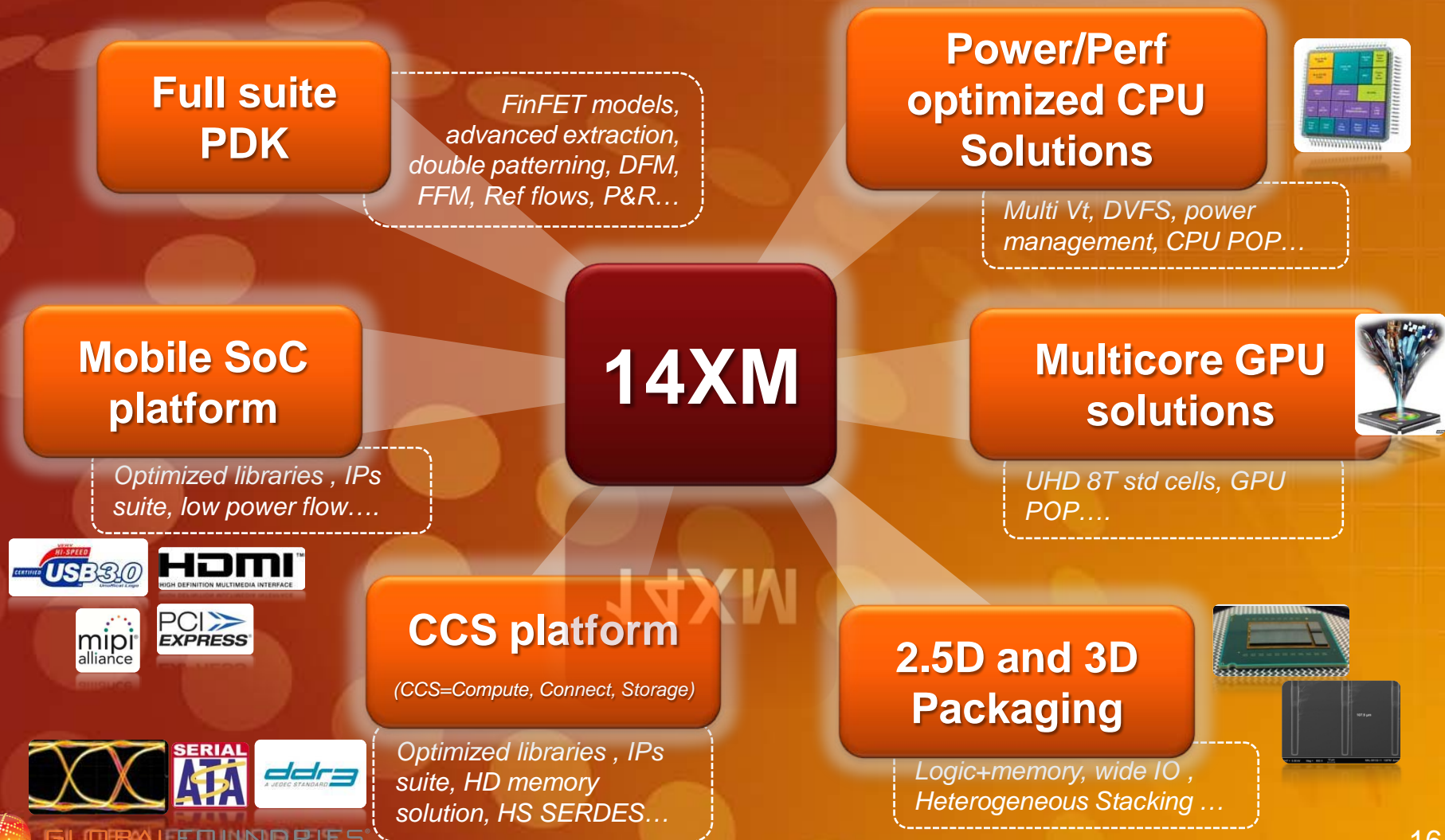
14XM - Power / Performance Benefits



14XM allows for Vdd reduction while maintaining performance
40-60% increased battery life depending on Applications



Product Leadership Is More Than “Just The Fin”



Bringing New Partnership Models with Collaborative Device Manufacturing (CDM)

Traditional Model

Geographically
centralized

Pre-packaged
technology

Homegrown R&D

Opportunistic
investment

Contract manufacturer

Current Model

Globally distributed

Optimized
design solutions

Collaborative
innovation

Long-term
commitment

Foundry partner

Collaborative Device Manufacturing

Best of IDM world + flexibility
of foundry model

Seamless collaboration

Innovate on our platform

Extension of customer's
strategy

Shared investment / success

Collaborative Partner



Key Messages

Technology Leadership

GLOBALFOUNDRIES is accelerating customer deployment of FinFET technology

Fastest Time to Volume

14nm-XM is a modular FinFET that utilizes a 14nm class FinFET device, leveraging 20nm HKMG maturity

Collaborative R&D

We have more than 10 years of FinFET R&D as we prepare to bring this technology to production

First Mobile optimized FinFET

Carefully optimized technology architecture for next-generation mobile devices and other SoCs , from the transistor up to the system level





THANK YOU

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